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5

THE HISTORY OF HUT 6

IN THREE VOLUMES

VOL. III

STATISTICAL APPENDIX:

TABLES AND GRAPHS

"Can you do Addition?" the White Queen asked. "What's one and one and one and one and one and one and one and one and one and one?"

"I don't know," said Alice. "I lost count."

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GLOSSARY

COMPARATIVE CHRONOLOGICAL TABLE

Date	War History	Traffic Analysis	Cryptography	Organisation
1939				
Sept. 3	War declared			
Oct.			Reconstructed Enigma received from the Poles	
1940				
Jan.		Red, Blue and Green identified	First break of war-time key	
April	Invasion of Norway	Yellow identified	Yellow broken regularly	Three shift system instituted
April 30			Change of indicating system	
May	Invasion of France, Holland and Belgium	Great increase in traffic Red the principal key 25 intercept sets in use	Red broken regularly by hand on cillies and ringstellung tips	
June 3	Dunkirk evacuation			
July			First steps in formation of theory of key rules	Control Section formed
August	Battle of Britain begins	First G.A.F. discriminant repeat discovered	First bombe arrives Reflector C broken Beginning of cribbery	
Sept.	Blits on London begins		First break of Brown	
Oct.	Italian invasion of Greece			Tentative formation of Research Section Crib Room set up

COMPARATIVE CHRONOLOGICAL TABLE (Continued)

Date 1940	War History	Traffic Analysis	Cryptography	Organisation
Nov.			First break of Wehrkreis since new indicating system started	
Dec.	British offensive in Western Desert		First break of Orange Discovery of pairing stecker on Brown: hence breaking on rods	
1941 Jan.	German forces in Africa	Light Blue identified		
Feb.			First break of Light Blue First break on R.E.	
April	German conquest of Greece		Monthly total of 79 breaks	
May	Sinking of Bismarck			
June	German invasion of Russia	Mustard and Vulture identified		Formation of R.R.2
August			First dottery	
Oct.	Battle for Moscow		Introduction by G.A.F. of a.m. and p.m. wheelorder changes	Liaison Party established at W.O.Y.G.

COMPARATIVE CHRONOLOGICAL TABLE (Continued)

Date	War History	Traffic Analysis	Cryptography	Organisation
1941 Dec.	Attack on Pearl Harbour	200 sets in use	Discovery of Army ringstellung rule Institution of kissing Vulture broken regularly on cillies and cribs	Control Room and Odd Colour reports started
1942 Jan.	German counter-offensive in Africa	Introduction of B Book by G.A.F. Fliegerkorps issued with separate keys	Monthly total of 160 breaks Development of R.E. technique	Crib Room report started
March			4152 Orange mystery solved	Quiet Room established
April		Monthly total of 64,000 teile intercepted Introduction of E Book by German Army	Discovery of key-repeats HOR-HUG stecker story	
May	Axis offensive in Libya		Monthly total of 241 breaks Discovery of figure code on 9840 Mustard First break of Greenshank since 1940	Hut 6 Report Part 3 starts VI.I.S. moved to Bletchley
June	Fall of Tobruk		First break of Phoenix	
July	Fall of Sevastopol		Introduction of thrice-daily wheelorder change by the German Army	Liaison with 3L established

COMPARATIVE CHRONOLOGICAL TABLE (Continued)

Date	War History	Traffic Analysis	Cryptography	Organisation
1942 August	Dieppe raid	Distinction between staff and ordinary army keys discovered	First break of Quince Monthly total of 512 breaks	
Sept.	Battle of Stalingrad	5 out of 6 G.A.F. keys use predicted discriminants	Orange uses thrice-daily wheelorder change	C.R.2 set up
Oct.	El Alamein		Brown II adopts 10 stecker pairings	
Nov.	Landings in North Africa	300 sets in use		Hut 6 Report Part 2 starts
Dec.	Retreat from Stalingrad	Monthly total of 83,000 teile intercepted	Quince changes to three wheelorder periods per day Wahlworts introduced on Army keys	
1943 Jan.	Capture of Tripoli	Introduction of Luftflotte keys	Probable introduction of Reflector D on Greenshank	
Feb.				Move into Block D Formation of Identification Party Inauguration of the Watch and Reconstitution of Research Section on permanent basis
March	Battle of Mareth Line	Introduction of new method of using G.A.F. discriminant book	Same key used with two or more sets of discriminants	

COMPARATIVE CHRONOLOGICAL TABLE (Continued)

Date 1943	War History	Traffic Analysis	Cryptography	Organisation
April	Offensive in Tunisia	93,000 teile intercepted	Wahlworts on Locust	Training syllabus prepared Army Research set up
May	End of North African campaign			
June		Discriminant put as trigram in preamble instead of in first group	100% record on Orchid First break of Albatross New style G.A.F. key repeats	
July	Invasion of Sicily	Introduction of second G.A.F. discriminant book Common discriminant block for staff keys used by German Army	Monthly total of 412 breaks First break of Puma Discovery of stecker patterns on Albatross	Daily meeting of Watch and Research officers
August	Systematic bombing of Hamburg		Discovery of Nigelian wheelorders	
Sept.	Capitulation of Italy	German Army stops the universal use of discriminants	First break of Shrike, Wryneck and Nuthatch	Inauguration of Lage conferences with 3L Negotiations for the increased use of U.S.A. bombes P.S.M-B becomes head of Hut 6
Oct.			Suspicion of new security devices on Greenshank	First American personnel join the hut Operational use of Oxo

COMPARATIVE CHRONOLOGICAL TABLE (Continued)

Date	War History	Traffic Analysis	Cryptography	Organisation
1943 Nov.	Battle of Berlin begins	G.A.F. stops the universal use of discriminants New system of blisting Eastern Front keys	Nuthatch decodes on 6 wheelorders	Formation of Traffic Identification Section
Dec.			Wryneck key repeats Breaking of Bullfinch on date stagger	Formation of the Duddery
1944 Jan.	Battle of Cassino	Monthly total of 100,000 teile intercepted	First break of Reflector D on Red Breaks on Berlinismus and Viennismus	BOVO Section set up
Feb.		Introduction of third G.A.F. discriminant book	First break of Roulette I	
March	Russian offensive in the Ukraine		Double encoding on Raven First break of Nightjar Monthly total of 717 breaks	
April		Introduction of the F Book by the G.A.F.	Greenshank broken by hand by stecker knock-out method	
May	Attack on Gustav Line	500 sets in use 125,000 teile intercepted	First break of Corncrake Introduction of Zusatz stecker	T.I.S.1 took over all operational G.A.F. keys

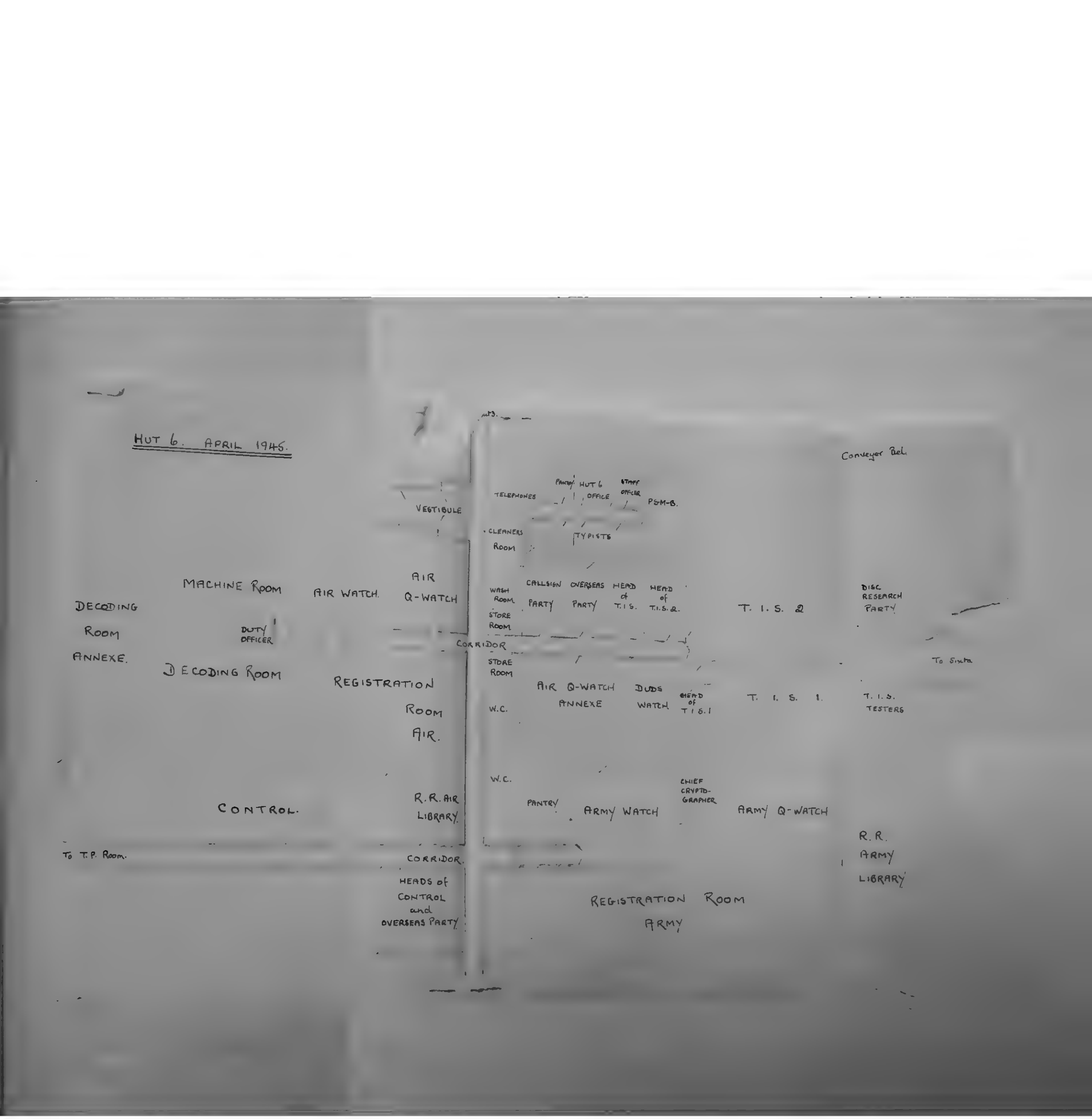
COMPARATIVE CHRONOLOGICAL TABLE (Continued)

Date 944	War History	Traffic Analysis	Cryptography	Organisation
June	Invasion of Normandy	600 sets in use 140,000 teile intercepted Serial Sorting system began	First break of Western Front Army operational key	Army Watch formed
July		Heydays of Sector Investigation begin	Enigma Uhr broken First break of Jerboa Monthly total of 945 breaks	
August	Landing in Southern France Liberation of Paris	First arrival of captured keys on a large scale	Extended use of Reflector D on Air keys	
Sept.	Battle of Arnhem	Use of Notschlüssel on the Western Front	First success of Bobbery Introduction of anti-cilli devices Use of CY starts	
Oct.	Occupation of Athens Fall of Aachen	156,000 teile intercepted		T.I.S.1 responsible for all G.A.F. keys Duenna ready for use
Nov.	Liberation of Belgium	Encoding of Army callsigns	Puma broken on Giant New type Enigma Uhr broken Extension of Wahlworts on Air keys	Abolition of Army Research Henceforth Watches Air A and Q, Army M and R Division of Hut 6 on Air/Army basis

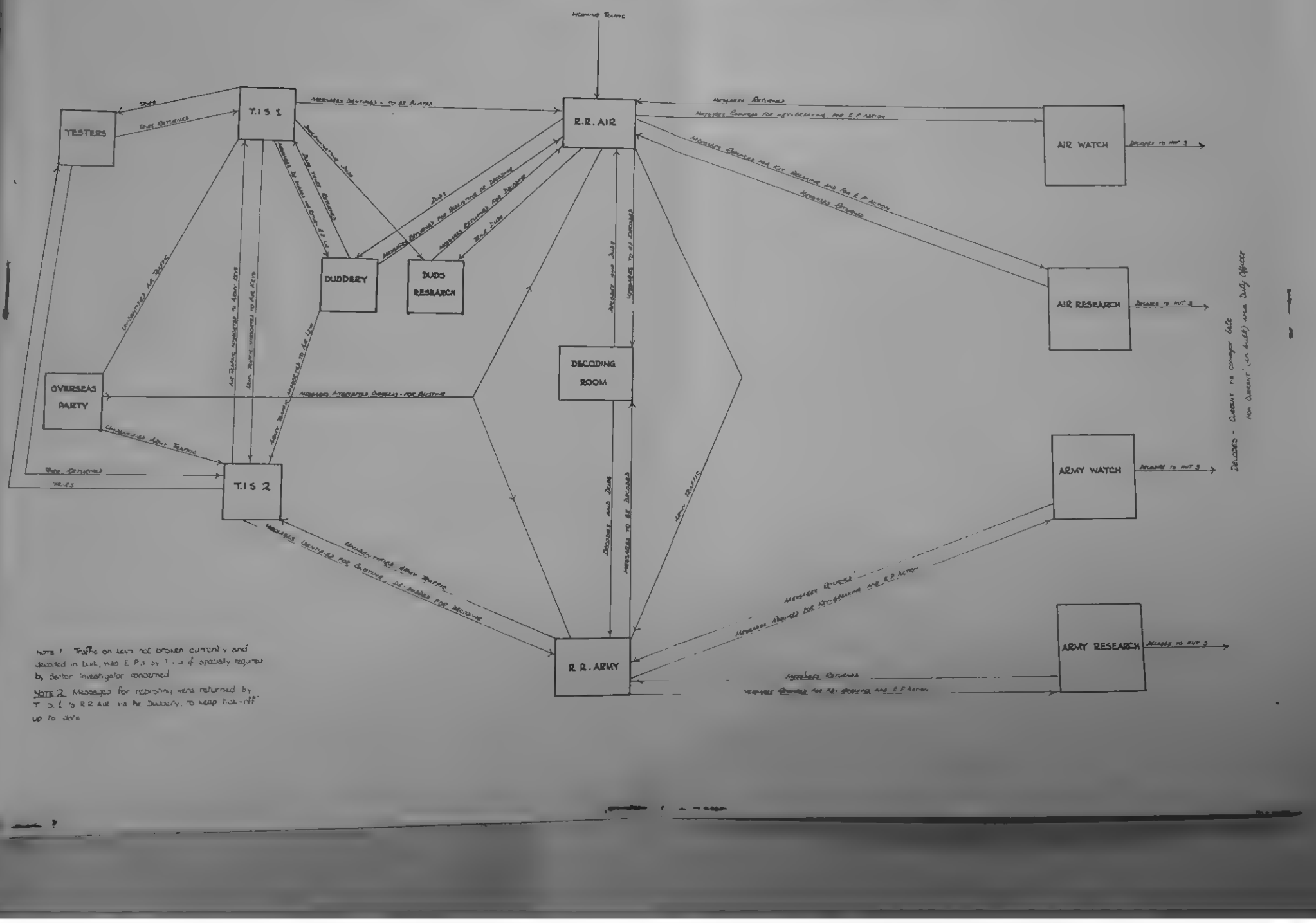
COMPARATIVE CHRONOLOGICAL TABLE (Continued)

Date	War History	Traffic Analysis	Cryptography	Organisation
1944 ec.	German counter-offensive in the Ardennes	German Luftgau issued with separate keys	Red stecker repeat	
1945 an.	Capture of Warsaw	Sorting by Notation Number commenced Encoded callsigns and changing frequencies on the Autos		Statistical Section set up
eb.	Fall of Budapest	G.A.F. introduced universal callsign encoding and change of frequencies	First break of Ibis Monthly total of 478 breaks	Watch Liaison Party set up Autoscritcher ready for use
arch	Crossing of the Rhine	Establishment of callsign repeats		Formation of the special Callsign Party
pril	Surrender of German forces in Italy	Callsigns changed every 3 days only	Capture of numerous S.S. keys	
ay	Victory in Europe			Dissolution of Hut 6

HUT 6. APRIL 1945.



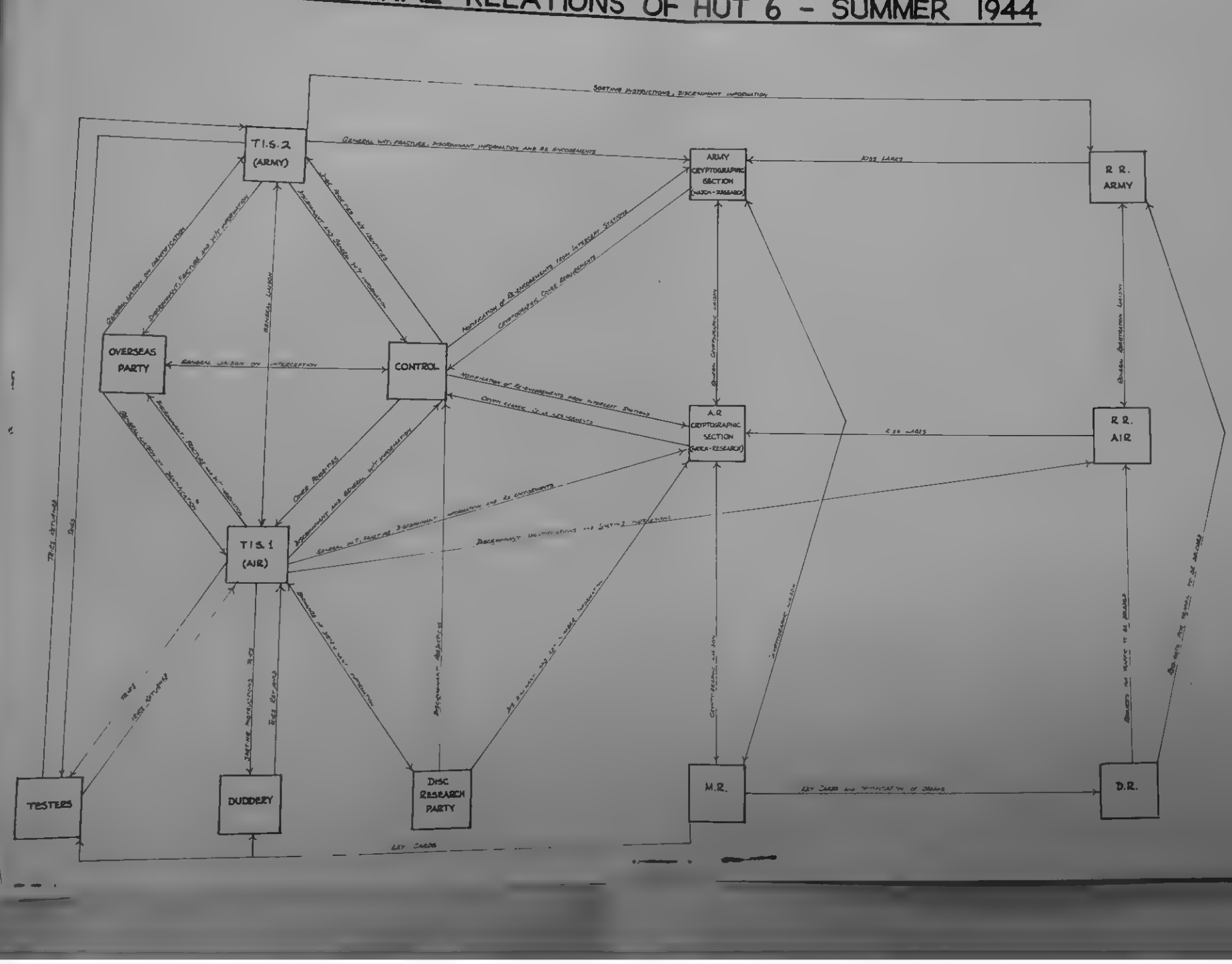
TRAFFIC LANES - HUT 6 - SUMMER 1944



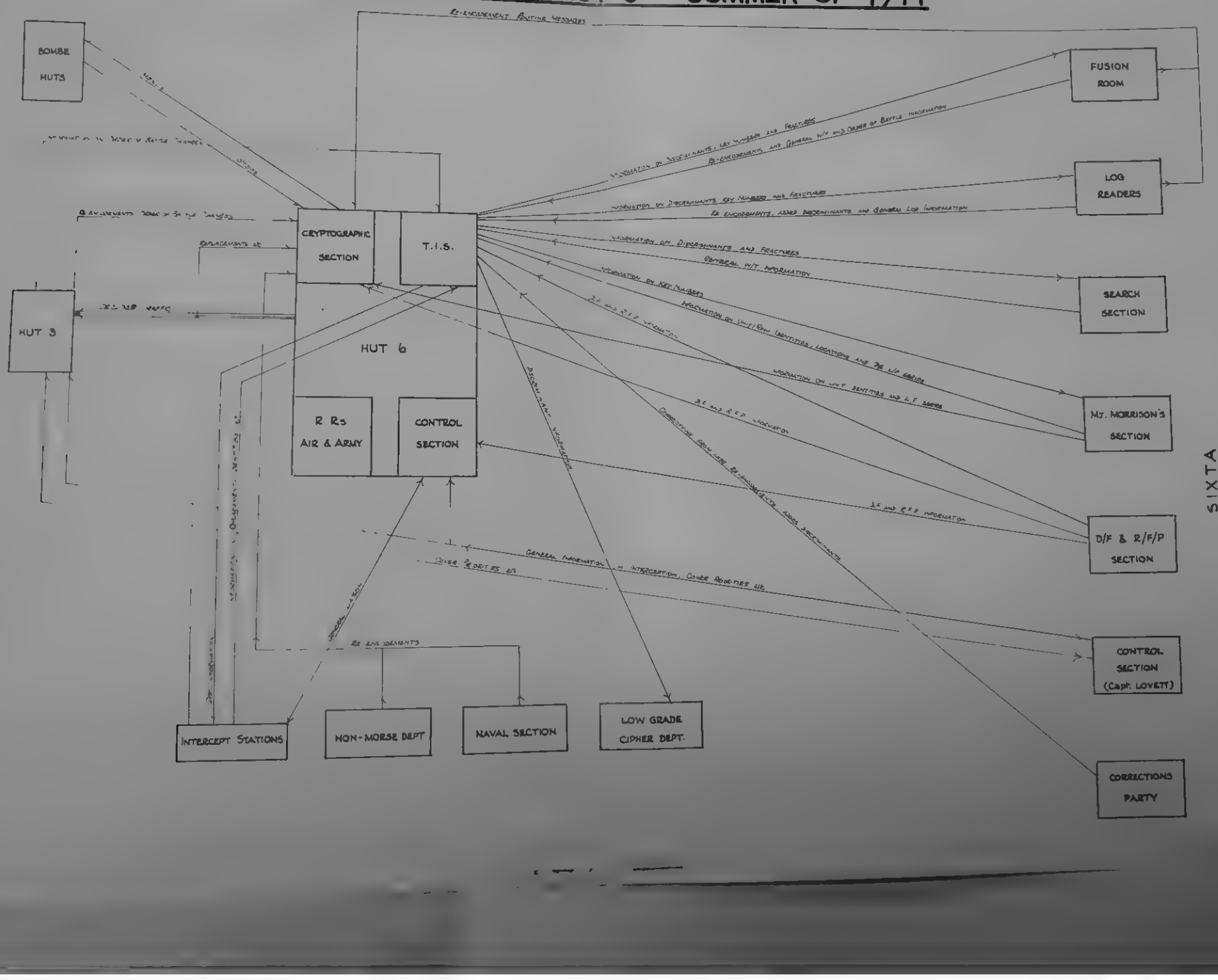
NOTE 1 Traffic on lines not broken currently and identified in Dark, was E.P.'s by T.I.S if specially required by Sector Investigator concerned

NOTE 2 Messages for rephasing were returned by T.I.S 1 to R.R. AIR via the Duddery, to keep Pick-off up to date

INTERNAL RELATIONS OF HUT 6 - SUMMER 1944



EXTERNAL RELATIONS OF HUT 6 – SUMMER OF 1944

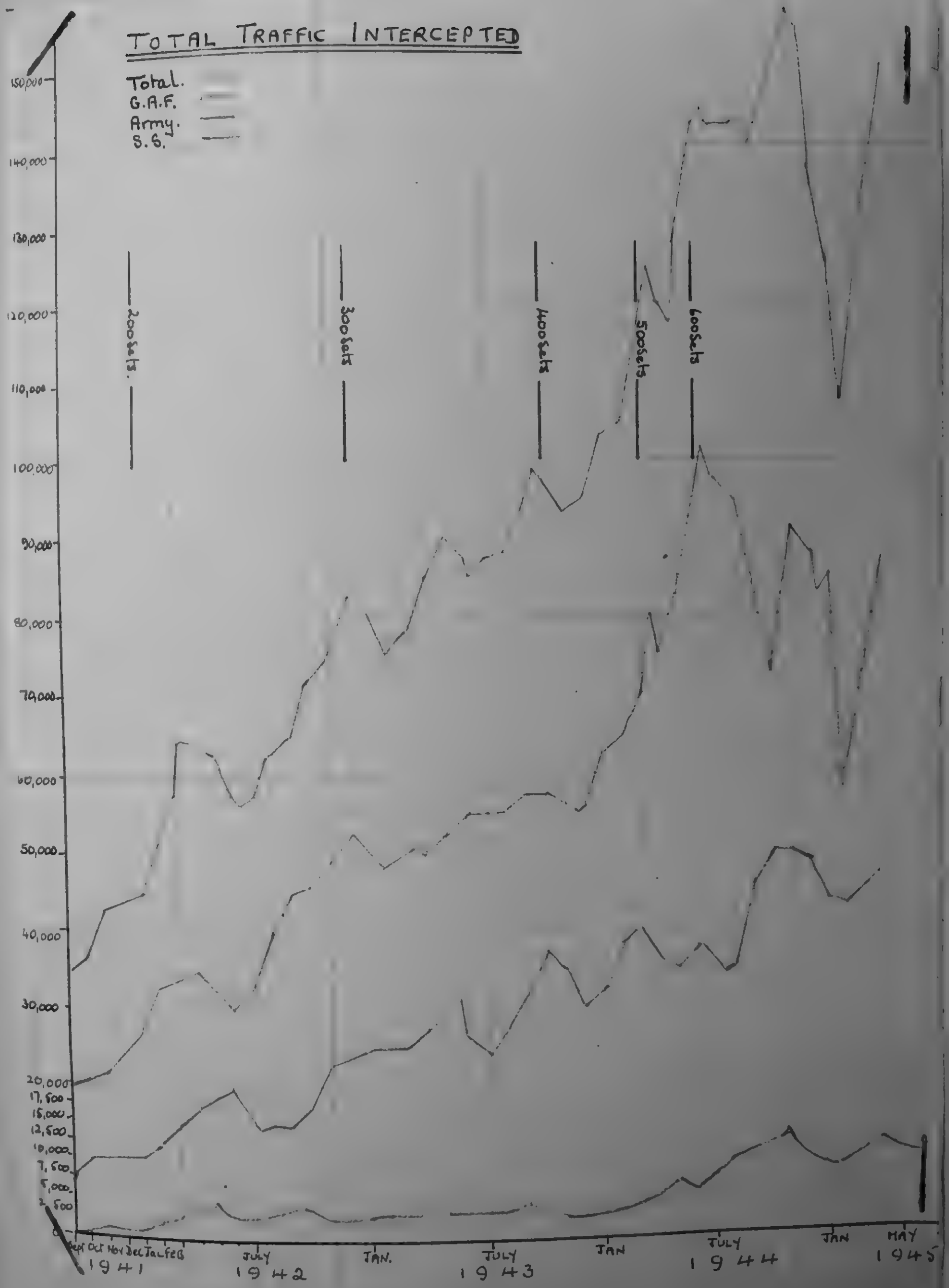


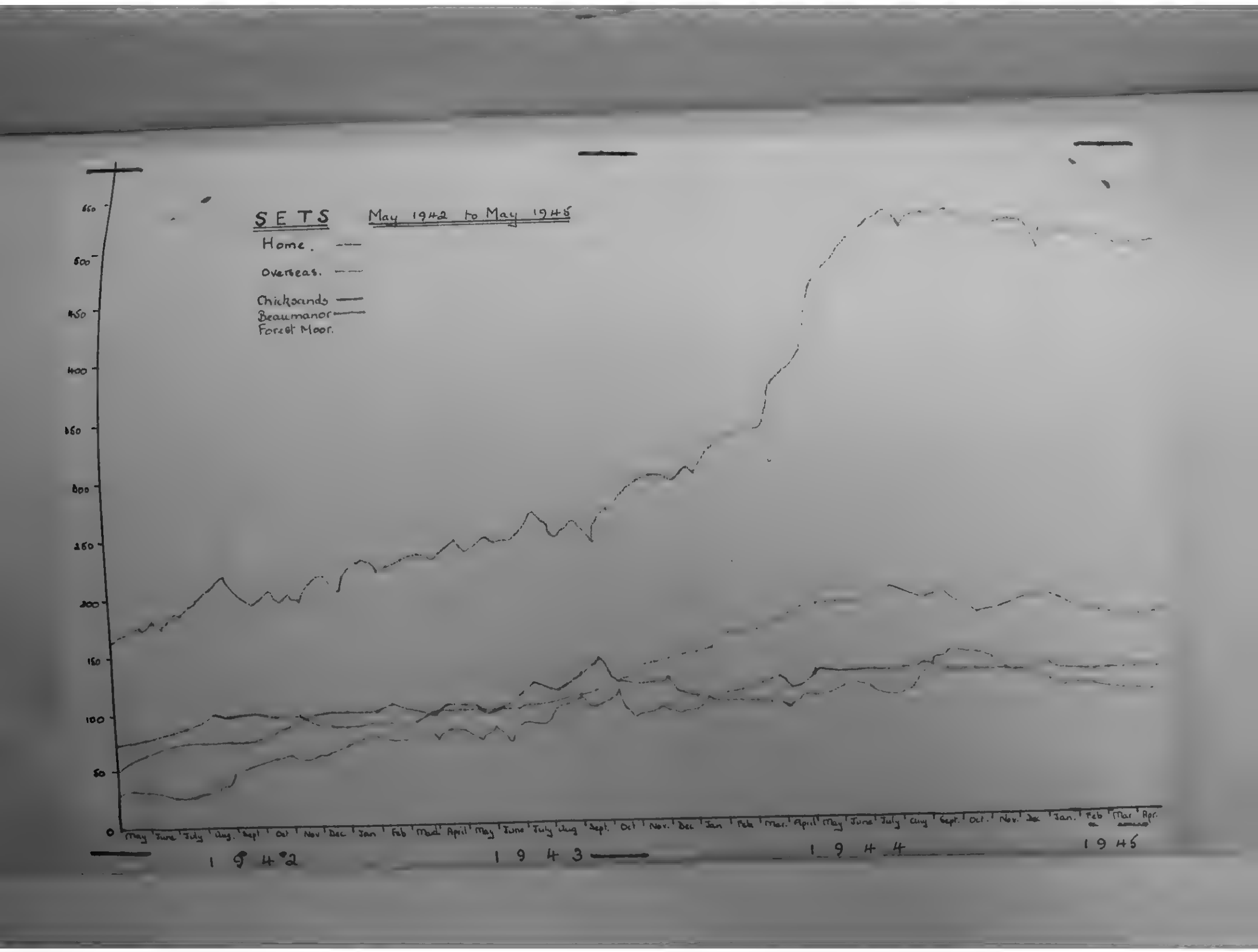
TRAFFIC, BREAKS AND DECODES: STATISTICAL TABLE

Quarterly Period	Traffic Total	Blist Total	Breaks	Decodes
July - Sept 1939			12	
Oct. - Dec.			4	
Jan. - March 1940			48	
April - June			91	
July - Sept.			107	
Oct. - Dec.			180	
Jan. - March 1941			206	
April - June			210	
July - Sept.			223	
Oct. - Dec.	120,000+		352	
Jan. - March 1942	154,000+		511	
April - June	198,485	179,390	731	
July - Sept.	181,734	168,255	1081	
Oct. - Dec.	272,997	253,956	1314	
Jan. - March 1943	250,403	243,437	1025	
April - June	288,178	270,827	1236	
July - Sept.	302,382		1361	
Oct. - Dec.	277,953		1674	
Jan. - March 1944	314,143	302,324	1862	
April - June	342,000+		2239	
July - Sept.	420,000+		2554	186,687
Oct. - Dec.		437,161	2146	184,798
Jan. - March 1945		406,538	1821	141,000
April - May		132,978	983	41,044
		Total	21,971	

Note:- + Approximate figures only.
The Traffic Total was calculated by Control from stations' reports; the Blist Total was calculated from R.R. statistics and excludes all unidentified messages.

TOTAL TRAFFIC INTERCEPTED

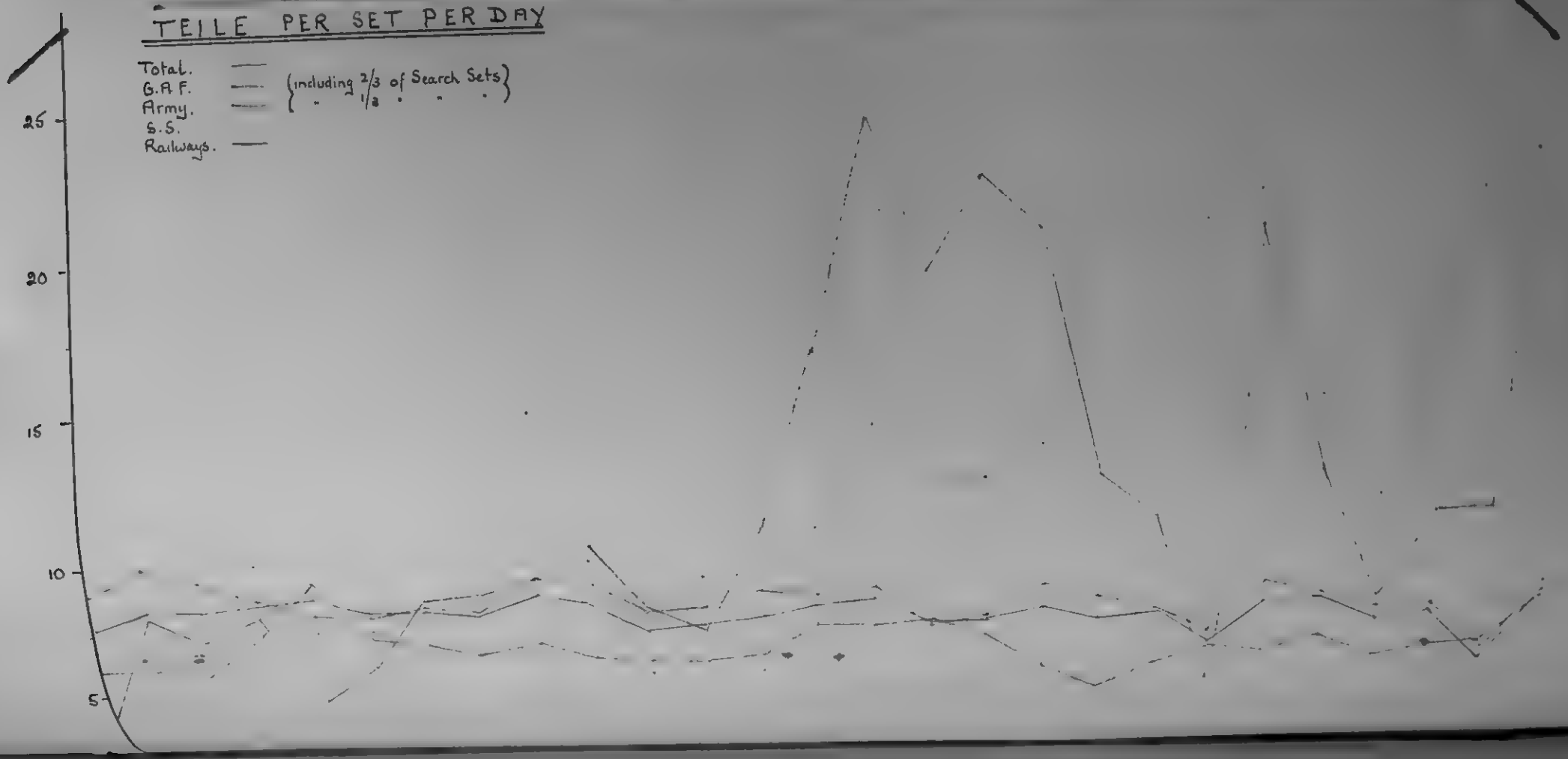



SETS
May 1942 to May 1945
Home.
Overseas.
Chicksands
Beaumanor
Forest Moor.
650
600
450
400
350
300
250
200
150
100
50
0
May June July Aug. Sept Oct Nov Dec Jan Feb Mard April May June July Aug Sept. Oct Nov. Dec Jan Feb Mar. April May June July Aug Sept. Oct. Nov. Dec Jan. Feb Mar Apr.
1942
1943
1944
1945

TEILE PER SET PER DAY

Total. ——
G.A.F. ——
Army. ——
S.S.
Railways. ——

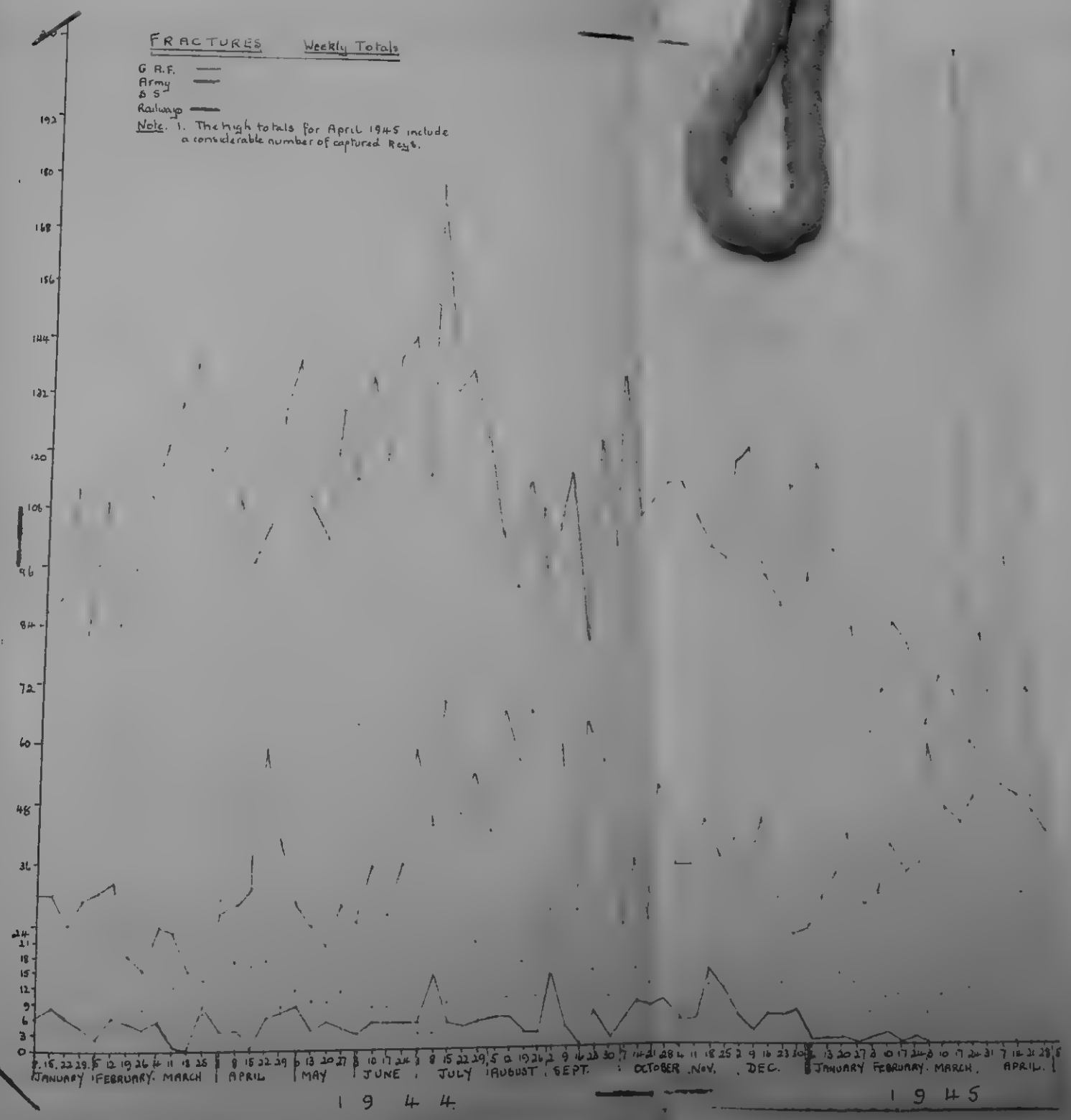
{including 2/3 of Search Sets
" 1/3 " " "}



FRACTURES Weekly Totals

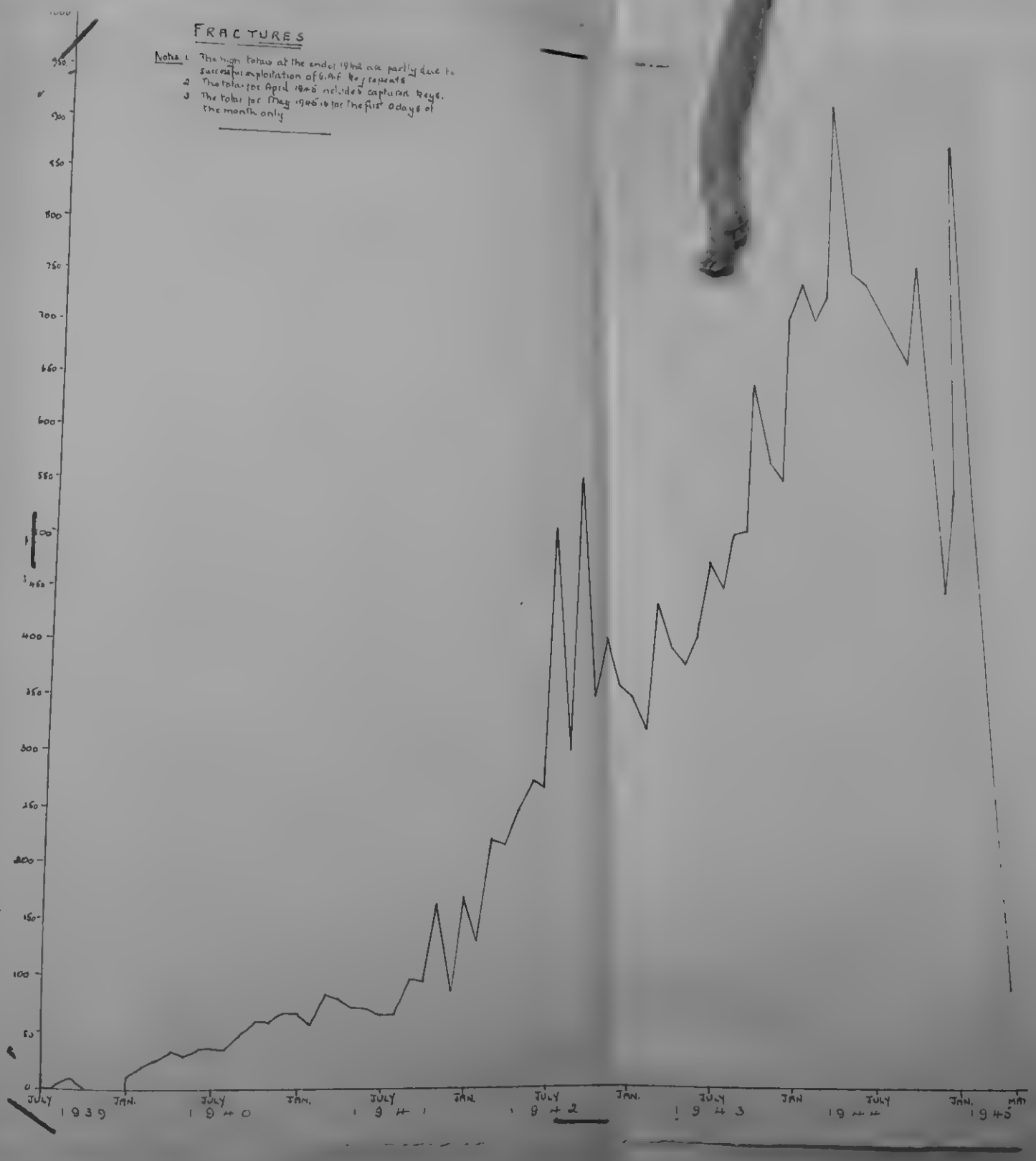
G.R.F. —
Army —
& S
Railways —

Note. 1. The high totals for April 1945 include a considerable number of captured Regs.

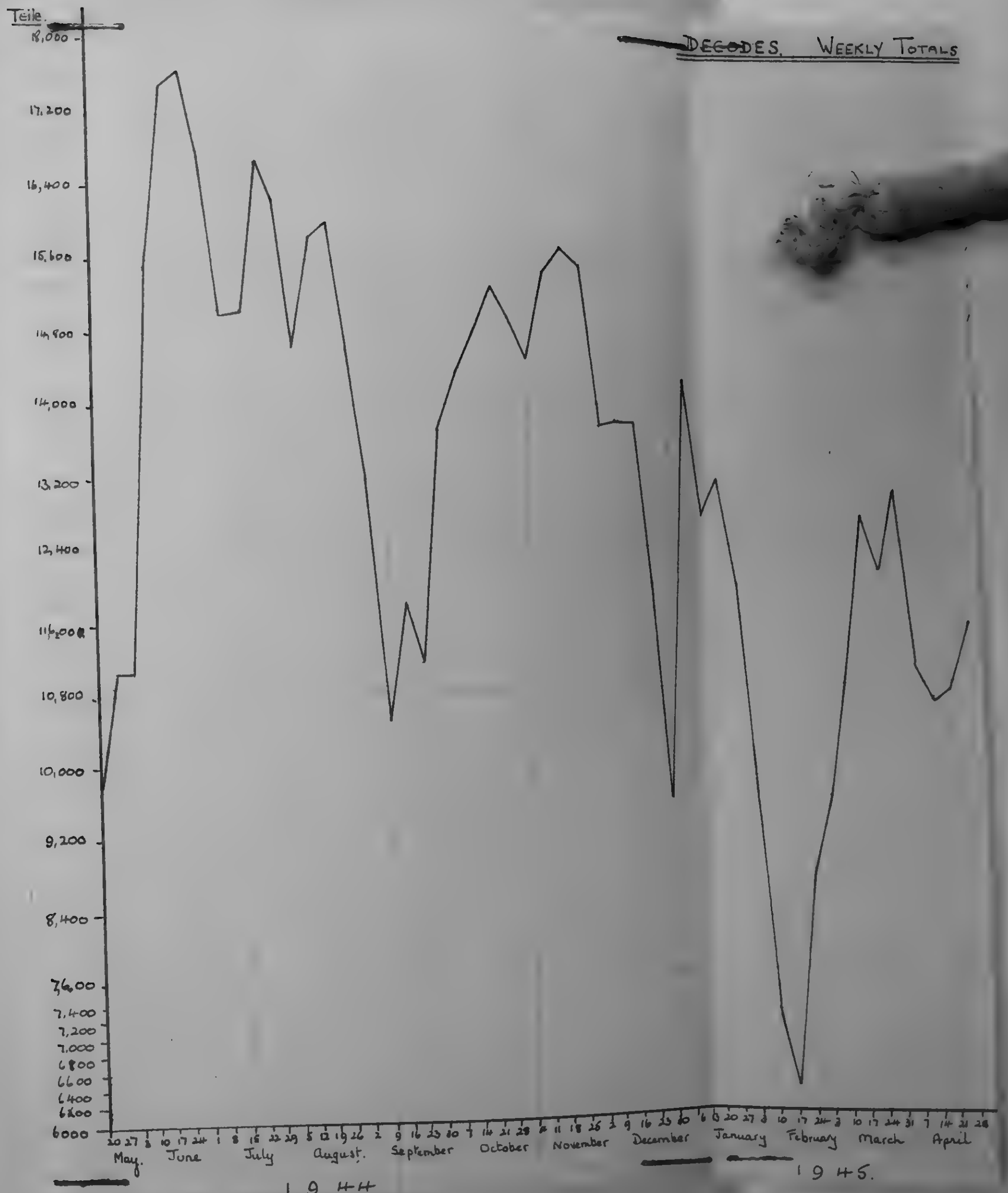


FRACTURES

Notes 1. The high totals at the end of 1942 are partly due to successful exploitation of G.A.F. by repeats
2. The total for April 1945 includes captured keys.
3. The total for May 1945 is for the first 9 days of the month only



DECODES. WEEKLY TOTALS



BOMBE STATISTICS: INTRODUCTORY NOTE

With the increase in the number of bombes in 1943, it became apparent that some form of checking the running times of the menus on these machines had become necessary. Consequently it was arranged that each bombe outstation should furnish a daily record of the jobs run on their machines, these records being extracted from the machine log books and giving the following details:-

1. Name of Job (i.e. Key name)
2. Job number
3. Menu number
4. Number of runs done by machine
5. Time that job was received by machine
6. Time that job was completed by machine
7. Time that machine was stripped of job
8. Details of any delay in the running of the machine doing a job due to mechanical faults

Upon receipt of these daily records from the outstations they were analysed and the following details extracted:-

1. Number of jobs completed on all machines in action
2. Total number of runs on all machines in action
3. Total number of machines at outstations
4. Total number of machines in action at outstations
5. Total number of delays over half an hour between completion of job and stripping of machine
6. Total number of delays over one hour between stripping of job on machine and receipt of the following job.+

At the end of each month these details were summarised and the average numbers of jobs and runs per machine-day were obtained. A summary of these figures from May 1943 to April 1945 is shown in the following tables together with specimen copies of the forms used.

From these figures there seems to have been a progressive improvement, not only in the amount of work done per machine, but also in the various stages of work being passed to a machine. These improvements were largely due to the improvement in communications between the sections concerned and also to the fact that the attention of the people concerned was continually being drawn to delays, this giving them a chance to alter routines in order to effect an improvement.

It should be mentioned here that other bombe statistics - viz. the numbers of each type of bombe in use at various dates - will be found in the chapter on The Bombe in the technical history.

+ The total number of machines in action was arrived at by extracting all mechanical machine delays in excess of half an hour and deducting the total machine-days obtained from the daily total number of machines at the outstations.

SPECIMEN OF DAILY TIME-SHEET ISSUED BY BOMBE OUTSTATION

Date: 29.4.45. RUSSIA BAY Eastcote

JOB	JOB NO.	M	NO. OF RUNS	JOB RECEIVED BY M/C	JOB COMPLETE	M/C STRIPPED	REMARKS
5. BRIANSK			1769				
WASP	333	38	11	B/f	0255	0300	
RAVEN	179	4	8	0310	0615	0617	
DAFFODIL	358	1	11	0635	0959	0957	
JAGUAR	362	5	7	1020	1340	1345	
AVOCET	367	6	10	1415	1720	1725	Job up
JAGUAR	366	33	10	1743	2110	2120	
AVOCET	217	76		2121	Carried	forward	
6. ROSTOV							
AVOCET	290	18	8	B/f	0218	0218	Job up
AVOCET	217	55	9	0255	0605	0610	
B'YARD	357	3	9	0629	0920	0920	
JAGUAR	369	2	9	0949	1235	1240	
DAFFODIL	358	9	10	1249	1636	1640	
MONKEY	373	1	4	1647	1825	1825	Job up
WASP	376	2	11	1840	2323	2325	
7. OREL							
DAFFODIL	283	35	16	B/f	0405	0415	
RAVEN	179	4	5	0418	0620	0630	
GENTIAN	350	4	12	0640	1045	1055	
LORIENT	363	4	7	1108	1915	2359	Machine out of action 1535-2359
8. KHARKOV							
AVOCET	290	22	11	B/f	0220	0220	
AVOCET	217	61	10	0239	0535	0540	
OCELOT	160	24	10	0555	0850	0855	Job up
DAFFODIL	284	16	7	0855	1246	1251	
JAGUAR	366	5	10	1322	1600	1605	
JAGUAR	367	26	17	1615	2130	2135	
AVOCET	217	76		2208	Carried	forward	
9. STALINGRAD							
DAFFODIL	283	36	17	B/f	0620	0625	
GENTIAN	350	4	12	0640	1100	1113	
DAFFODIL	284	22	[illegible]	1127	1344	1344	
OCELOT	367	6	10	1412	1730	1730	Job up
JAGUAR	366	33	[illegible]	1743	2104	2107	
AVOCET	217	76		2215	Carried	forward	
			2046				

DAILY RECORD SHEET STAINMORE I

Date		Complete Jobs 6	Complete Jobs 8	Runs	M/c at Station	M/c in Action	Delays over ½ hour between completion of job and stripping 6	Delays over ½ hour between completion of job and stripping 8	Delays over 1 hour from completion to receipt of next job 6	Delays over 1 hour from completion to receipt of next job 8
Oct.	1	211	6	1985	43	42	1	-	1	2
	2	190	11	1782	44	43	2	-	-	-
	3	161	15	1973	44	43	1	1	6	-
	4	169	25	1986	44	43	2	-	1	1
	5	199	10	1823	44	43½	5	2	7	-
	6	209	15	1910	45	44	1	-	1	1
	7	166	34	2026	45	44½	1	-	3	3
	8	176	41	1827	45	44	3	2	-	-
	9	208	16	1926	45	44½	5	-	-	-
	10	240	2	1991	45	44½	2	-	1	-
	11	246	-	1941	45	44½	2	-	-	-
	12	197	12	1955	45	44	2	-	-	-
	13	217	28	1994	45	43	2	-	1	-
	14	209	16	2003	45	44	5	-	1	-
	15	238	12	2098	45	42½	4	-	-	1 + +
	16	229	4	1777	45	43½	1	-	-	-
	17	206	23	1922	45	44	1	-	1	-
	18	233	12	1887	45	43½	4	-	-	-
	19	233	13	1999	45	43½	-	-	1	-
	20	237	2	2006	45	44	3	-	3	-
	21	215	22	1951	45	43½	4	-	-	-
	22	222	7	2044	45	44½	1	-	-	-
	23	226	22	2070	45	44	1	-	-	-
	24	225	7	1835	45	44½	3	-	4	-
	25	227	9	1952	45	44	2	-	2	1
	26	224	24	2087	45	44	-	-	1	-
	27	210	25	1986	45	44	2	-	1	1
	28	223	19	2002	45	44	5	-	-	-
	29	257	13	1934	45	44	1	-	-	-
	30	234	2	1896	45	43	5	-	3	-
	31	229	14	2025	45	43	-	-	-	-
		6666	461	60593	1389	1355	71	5	40	10
							Percentage			
							1	1	1	2
					All jobs		1		1	

Jobs per machine-day 5·26
Runs " " " 44·72
Average time in action of machines 97·55%

+ A lot of cases of "no jobs": these delays have been omitted: runs correct

ANALYSIS OF MACHINE PERFORMANCES
STANDARD MACHINES : I GENERAL STATISTICS

Date	Average No. of operational and recorded machines		Percentage of maximum time in action	No. of jobs completed			No. of Runs	Remarks
1943	At Outstations	In Actiom		Hut 6	Hut 8	Total		
May	62			4331	2681	7012	60682	It has not been possible to find out the exact number of machines recorde during May, June and July: from Sept. onwards major machine delays were recorded and it then became possible to give accurate output figures (i.e. product of machines whilst in action)
Jun.	65			3709	2279	5986	66788	
Jul.	66			6071	1030	7101	72532	
Aug.	66			7232	743	7975	73333	
Sept.	64	62	96·71	6261	875	7136	68944	
Oct.	61	59	96·03	6477	1473	7950	65749	
Nov.	59	57	96·57	5980	974	6954	62001	
Dec.	59	54	93·23	5635	1076	6711	60692	
1944								
Jan.	53	50	95·21	5359	1392	6751	56362	
Feb.	66	63	96·64	6526	1150	7673	65841	Feb. 29 days only
Mar.	70	64	92·16	7933	1164	9097	72091	
Apr.	72	68	93·60	8472	1081	9553	78188	
May	78	75	95·70	9783	1010	10793	88780	
Jun.	86	83	96·86	11965	838	12803	107189	
Jul.	91	88	96·02	13776	829	14605	118932	
Aug.	102	97	96·30	14588	647	15235	130462	
Sept.	109	105	96·61	15557	611	16168	141671	
Oct.	118	115	97·39	18536	528	19064	166572	From 1st Nov. Hut 8 ceased to use these machines: this accounts for increase in runs: in Dec. Hut 8 resumed use of standard machines
Nov.	130	127	97·56	21194	-	21194	193506	
Dec.	131	128	97·57	20627	260	20887	204114	

I GENERAL STATISTICS (Continued)

Date	Average No. of operational and recorded machines		Percentage of maximum time in action	No. of jobs completed			No. of Runs	Remarks
	At Outstations	In Action		Hut 6	Hut 8	Total		
1945								
Jan.	132	129	97·91	21780	340	22120	205185	
Feb.	132	129	97·02	20095	611	20706	190805	28 days
Mar.	131	129	98·05	23920	664	24584	220934	
Apr.	131	129	97·73	21573	619	22192	257737	Reduced output due to jobs being more difficult and to the generally confused state of affairs

II Average time in minutes for various stages at all outstations based on the complete work of at least four individual days each month. All stages involving machine delays have been omitted.

Date	From receipt of jobs to start of first run			From start of first run to checking of first stop			From completing of job to stripping			Idle time between jobs			Remarks
	Hut 6	Hut 8	All Jobs	Hut 6	Hut 8	All Jobs	Hut 6	Hut 8	All Jobs	Hut 6	Hut 8	All jobs	
1943													
May	24	37	29	26	24	25	27	39	32	38	27	34	
June	26	35	29	24	27	25	31	31	31	37	29	35	
July	25	36	27	22	21	22	25	16	24	33	34	33	
Aug.	22	28	23	19	23	20	19	19	19	31	39	33	
Sept.	24	30	25	19	21	19	24	12	22	29	46	31	
Oct.	24	30	25	18	22	19	24	22	24	28	38	30	
Nov.	23	25	23	18	18	18	23	21	23	26	35	27	
Dec.	23	32	24	18	19	19	19	17	19	25	29	26	
1944													
Jan.	24	26	24	18	19	18	17	11	16	23	32	25	
Feb.	25	27	26	19	21	20	19	11	17	22	32	25	
Mar.	24	25	24	19	18	19	19	14	17	19	29	22	
Apl.	25	24	25	18	16	18	17	14	17	18	36	20	
May	22	26	23	18	20	18	22	22	22	19	27	20	
June	20	20	20	18	14	17	14	10	13	25	25	25	
										Shortage of jobs due to Second Front priorities			
July	21	21	21	18	15	18	10	14	10	21	19	21	
Aug.	-	Dropped	-	-	Dropped	-	9	8	9	17	21	18	
Sept.							8	9	[illegible]	17	19	18	
Oct.							[illegible]	7	[illegible]	16	17	16	

Date	From receipt of jobs to start of first run			From start of first run to checking of first stop			From completing of job to stripping			Idle time between jobs			Remarks
	Hut 6	Hut 8	All Jobs	Hut 6	Hut 8	All Jobs	Hut 6	Hut 8	All Jobs	Hut 6	Hut 8	All Jobs	
1944													
Nov.							7	-	7	14	-	14	
Dec.							6	9	6	17	17	17	
1945													
Jan.							7	10	7	15	16	15	
Feb.							5	10	6	14	24	15	
							From completion to time of receipt of next job						
Mar.										21	30	21	
Apl.										19	26	20	

III *Percentage* of jobs taking more than a specified time for various stages (excluding stages involving machine delays) based on daily figures.

Date	From receipt of job by machine to start of first run In excess of ½ hour			From start of first run to checking of first stop In excess of ½ hour			From completion of job to receipt of order to strip In excess of 1 hour			Idle time between jobs In excess of 1 hour			Remarks
	Hut 6	Hut 8	All jobs	Hut 6	Hut 8	All jobs	Hut 6	Hut 8	All jobs	Hut 6	Hut 8	All jobs	
1943													
May	18	47	29	14	19	16	12	19	16	18	12	16	
June	20	44	29	15	21	17	10	12	11	15	11	13	
July	16	37	19	11	10	11	[redacted]	4	7	12	19	13	
Aug.	13	[redacted]	14	10	10	10	6	2	6	13	25	14	
Sept.	14	27	16	8	8	8	7	4	6	10	23	11	
Oct.	13	26	15	7	[redacted]	7	7	7	7	9	15	10	
Nov.	14	19	15	7	5	7	5	3	4	6	18	8	
Dec.	14	23	15	7	9	7	4	2	4	6	16	8	
1944													
Jan.	15	19	16	8	6	8	3	2	3	6	16	8	
Feb.	19	26	20	9	9	9	3	2	3	5	14	6	
Mar.	17	22	18	8	8	8	4	2	3	3	10	4	
Apl.	17	17	17	7	5	6	3	2	3	2	10	3	
May	12	17	13	5	6	5	6	3	5	2	4	2	
June	8	6	[redacted]	4	4	4	1	1	1	3	5	4	
July	7	10	8	4	3	4	0	0	0	1	2	1	
Aug.	-	Dropped	-	-	Dropped	-	0	0	0	1	2	1	
Sept.							X1	3	1	1	2	1	X Amended to in effect of ½ hr.
Oct.							1	1	1	1	2	1	
Nov.							0	-	0	0	-	0	
Dec.							1	0	1	2	4	2	
1945													
Jan.							0	0	0	1	5	1	
Feb.							0	1	0	1	19	1	
Mar.							From completion to time of receipt of next job over 1 hour						
Apl.										0	13	1	
										1	11	1	

ANALYSIS OF MACHINE PERFORMANCES
SPECIAL MACHINES : I GENERAL STATISTICS

The special machines at Gayhurst and Stanmore are referred to as Type 1, whilst a further type of special machines at Eastcote is referred to as Type 2.

Type 1 machines although reserved (after December) for Hut 8 jobs have completed a considerable number of Hut 6 jobs during the period covered by this summary, and figures for these jobs are included. The reservation referred to makes it impossible to give statistics similar to those given for the Standard machines.

Records of the special machines at Stanmore were first kept in October, and for Gayhurst in December, whilst similar records for the Type 2 machines at Eastcote were started in February.

Date	Average No. of operational and recorded machines to nearest figure		Percentage of maximum time in action	No. of jobs completed			No. of Runs	Remarks
	At Outstations	In action		Hut 6	Hut 8	Total		
Type 1 Machines								
1943								
Oct.	17	10	Not	20	628	648	5997	
Nov.	16	7	Recorded	163	400	563	5627	
Dec.	18	10	"	321	573	894	7197	
1944								
Jan.	21	14	"	10	902	912	8307	
Feb.	24	13	"	99	815	914	8024	
Mar.	23	18	"	307	1094	1401	21288	7 machines at Stanmore withdrawn from service
Apr.	24	18	75·00	509	762	1271	33878	
May	22	17	78·54	527	547	1074	49230	
June	24	19	80·34	1013	773	1786	62930	
July	26	21	80·64	1212	572	1784	75603	
Aug.	27	24	87·70	1666	575	2241	88621	

I GENERAL STATISTICS (Continued)

Date	Average No. of operational and recorded machines to nearest figure		Percentage of maximum time in action	No. of jobs completed			No. of Runs	Remarks
	At Outstations	In Action		Hut 6	Hut 8	Total		
Type 1 machines								
1944								
Sept.	27	22	84·87	1868	768	2636	97574	
Oct.	27	24	89·40	2199	627	2826	113395	
Nov.	27	24	88·84	1692	1260	2952	93369	
Dec.	27	25	94·35	1791	1486	3277	102191	
1945								
Jan.	30	27	91·83	1892	1514	3406	106594	
Feb.	30	27	86·78	1617	1326	2943	107979	
Mar.	35	31	87·90	2729	1755	4484	142813	
Type 2 machines								
1944								
Feb.	3	3	Not recorded	170	170	340	2698	
Mar.	4	4	- do -	470	103	573	4814	
Apl.	6	5	95·88	653	85	738	7036	
May	7	7	96·65	941	83	1024	9300	
June	8	[illegible]	95·42	1091	132	1223	11175	
July	8	7	90·62	1184	70	1254	11486	
Aug.	10	10	94·34	1507	59	1566	14902	
Sept.	12	10	87·39	916	527	1443	11842	
Oct.	11	10	89·80	731	548	1279	11750	
Nov.	11	10	90·61	263	1164	1427	8259	
Dec.	12	11	90·05	106	1224	1330	7914	

I GENERAL STATISTICS (Continued)

Date	Average no. of operational and recorded machines to nearest figure		Percentage of maximum time in action	No. of jobs completed			No. of Runs	Remarks
	At Outstations	In Action		Hut 6	Hut 8	Total		
Type 2 machines								
1945								
Jan.	12	11	91·27	374	1072	1446	9716	
Feb.	12	11	89·29	134	1181	1315	8290	
Mar.	12	11	94·22	1436	18	1454	9301	
Apl.	Uncompleted due to variations in Hut 8 jobs							

II. Average time in minutes for various stages based on the complete work of at least four individual days of each month. All stages involving machine delays have been omitted.

Date	From receipt of job to start of first run			From start of first run to checking of first stop			From completion of job to stripping			Idle time between jobs		
	Hut 6	Hut 8	All jobs	Hut 6	Hut 8	All jobs	Hut 6	Hut 8	All jobs	Hut 6	Hut 8	All jobs
Type 1 machines												
1943												
Oct.	31	32	32	20	24	23	21	20	20	See note in heading on special machines		
Nov.	22	26	25	15	23	20	29	20	23			
Dec.	22	30	27	12	24	18	28	11	19			
1944												
Jan.	-	27	27	-	23	23	-	9	9			
Feb.	20	26	24	17	22	21	17	8	9			
Mar.	32	35	34	15	29	25	23	10	14			
Apl.	29	32	31	15	30	24	16	14	15			
May	30	31	31	16	29	24	23	13	17			
Jun.	29	28	28	15	23	18	9	8	9			
Jul.	31	32	31	16	26	20	6	8	7			
Aug.	- - - - - - - - - - - - Dropped - - - - - - - - - -						10	6	8			
Sept.							8	7	8			
Oct.							7	9	8			
Nov.							6	5	6			
Dec.							5	7	6			
1945												
Jan.							5	7	6			
Feb.							7	8	7			
Mar.							7	9	7			

II. Average time in minutes for various stages based on the complete work of at least four individual days of each month. All stages involving machine delays have been omitted.

Date	From receipt of job to start of first run			From start of first run to checking of first stop			From completion of job to stripping			Idle time between jobs		
	Hut 6	Hut 8	All jobs	Hut 6	Hut 8	All jobs	Hut 6	Hut 8	All jobs	Hut 6	Hut 8	All jobs
Type 2 machines												
1944												
Feb.	36	32	33	24	30	28	10	19	15	24	68	48
Mar.	25	27	26	20	24	21	22	15	20	25	34	27
Apl.	26	30	28	18	20	19	19	14	17	21	42	29
May	22	24	23	19	16	18	24	11	22	21	33	23
Jun.	17	22	18	14	21	16	7	12	8	24	25	24
Jul.	17	22	18	13	20	16	8	12	9	21	25	22
Aug.	- - - - - - - - - Dropped - - - - - - - - - -						8	10	9	19	24	20
Sept.							6	10	8	18	13	16
Oct.							3	5	7	14	19	16
Nov.							7	7	7	Dropped		
Dec.							4	7	6	See note in heading on special machines		
1945												
Jan.							5	7	6			
Feb.							2	4	3			
Mar.							2	5	3			

III. Percentage of jobs taking more than a specified time for various stages (excluding stages involving machine delays), based on daily figures.

Date	From receipt of job by machine to start of first run In excess of ½ hr.			From start of first run to checking of first stop In excess of ½ hr.			From completion of job to receipt of order to strip In excess of 1 hr.			Idle time between jobs In excess of 1 hr.		
	Hut 6	Hut 8	All jobs	Hut 6	Hut 8	All jobs	Hut 6	Hut 8	All jobs	Hut 6	Hut 8	All jobs
Type 1 machines												
1943												
Oct.	15	32	32	15	19	19	15	7	7			
Nov.	28	32	31	7	15	13	14	5	8			
Dec.	14	28	23	3	19	13	7	6	6			
1944												
Jan.	-	31	31	-	17	17	-	2	2			
Feb.	44	29	31	6	21	19	5	4	4			
Mar.	46	38	40	7	27	23	7	2	4			
Apl.	38	36	37	7	24	17	7	2	4			
May	35	37	36	6	22	14	9	3	6			
Jun.	27	32	29	5	20	11	1	1	1			
Jul.	[redacted]	31	29	6	27	13	0	1	0			
Aug.	- - - - - - - - - - Dropped - - - - - - - - - -						0	1	0			
Sept.							+ 2	3	2			
Oct.							1	2	1			
Nov.							0	1	1			
Dec.							1	2	1			
1945												
Jan.							0	2	1			
Feb.							1	1	1			
Mar.							0	1	1			

See note in heading on special machines

+ From September onwards in excess of ½ hr.

III. Percentage of jobs taking more than a specified time for various stages (excluding stages involving machine delays), based on daily figures.

Date	From receipt of job by machine to start of first run in excess of ½ hr.			From start of first run to checking of first stop In excess of ½ hr.			From completion of job to receipt of order to strip In excess of 1 hr.			Idle time between jobs In excess of 1 hr.		
	Hut 6	Hut 8	All jobs	Hut 6	Hut 8	All jobs	Hut 6	Hut 8	All jobs	Hut 6	Hut 8	All jobs
Type 2 machines												
1944												
Feb.	36	33	34	8	22	15	2	4	3	7	29	18
Mar.	26	38	28	5	20	8	2	1	2	5	20	8
Apl.	26	22	26	3	8	3	3	4	3	0	9	1
May	10	19	11	2	1	2	5	1	5	2	10	3
Jun.	5	13	5	2	11	3	1	3	1	2	7	2
Jul.	5	9	5	2	4	2	0	1	0	2	0	2
Aug.	- - - - - - - - - - - Dropped - - - - - - - - - - -						0	0	0	1	16	2
Sept.							+ 1	2	1	1	7	3
Oct.							0	1	1	1	8	4
Nov.							1	2	2	Dropped		
Dec.							1	3	3	See note in heading on special machines		
1945												
Jan.							1	5	4			
Feb.							0	2	2			
Mar.							0	2	2			

+ From Sept. onwards in excess of ½ hr.